A satellite image of Earth showing a large cyclone over the North Atlantic. The cyclone is a prominent feature, with a clear eye and spiral cloud bands. The surrounding cloud cover is dense and textured. The image is in grayscale, highlighting the contrast between the dark clouds and the lighter areas of the Earth's surface and atmosphere.

UPDATES FROM COLUMBIA UNIVERSITY AND NASA GISS:  
COLD AIR OUTBREAK CLOUD TRANSITIONS AND CLOUD FEEDBACK

**Florian Tornow** and others

presenting at the 2023 ACTIVATE Science Team Meeting, Tucson, AZ

November 13th, 2023

# (1) CAO CLOUD TRANSITIONS DRIVEN BY A DRY INTRUSION

## RECENT PAPER IN JAS

- ▶ pre-campaign case with shorter overcast period farther north
- ▶ hypothesis: overlying DI imposes gradients in meteorology
  - reduced FT subsidence
  - greater FT humidity
  - in addition to greater MBL windspeed and lower temperature
- ▶ Lagrangian LES along four trajectories:
  - swifter MBL deepening causes sooner rain (via faster LWP buildup and CCN reduction)



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**On the impact of a dry intrusion driving cloud-regime transitions in a midlatitude cold-air outbreak**

Florian Tornow, Andrew S. Ackerman, Ann M. Fridlind, George Tselioudis, Brian Cairns, David Painemal, and Gregory Elsaesser

Online Publication: 27 Oct 2023  
 DOI: <https://doi.org/10.1175/JAS-D-23-0040.1>

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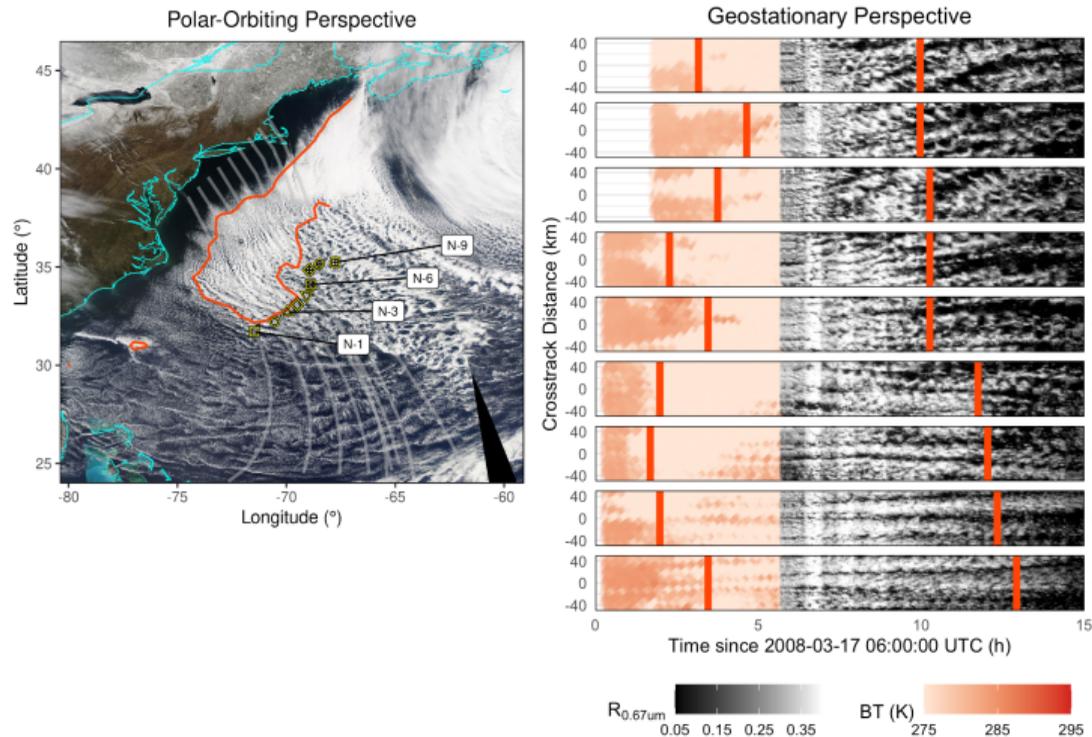
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**Abstract**

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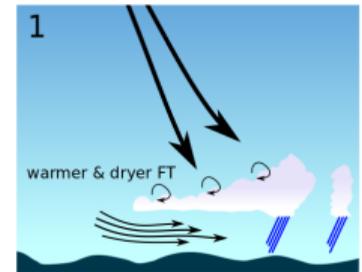
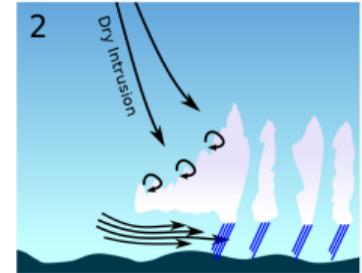
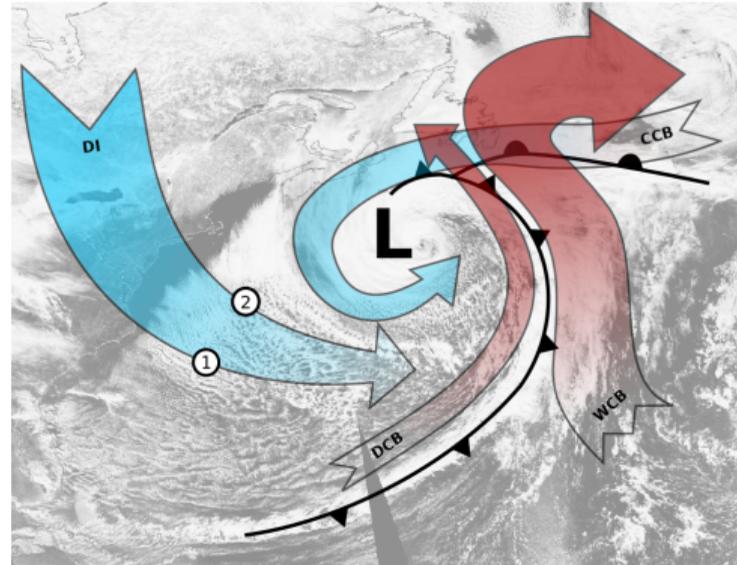
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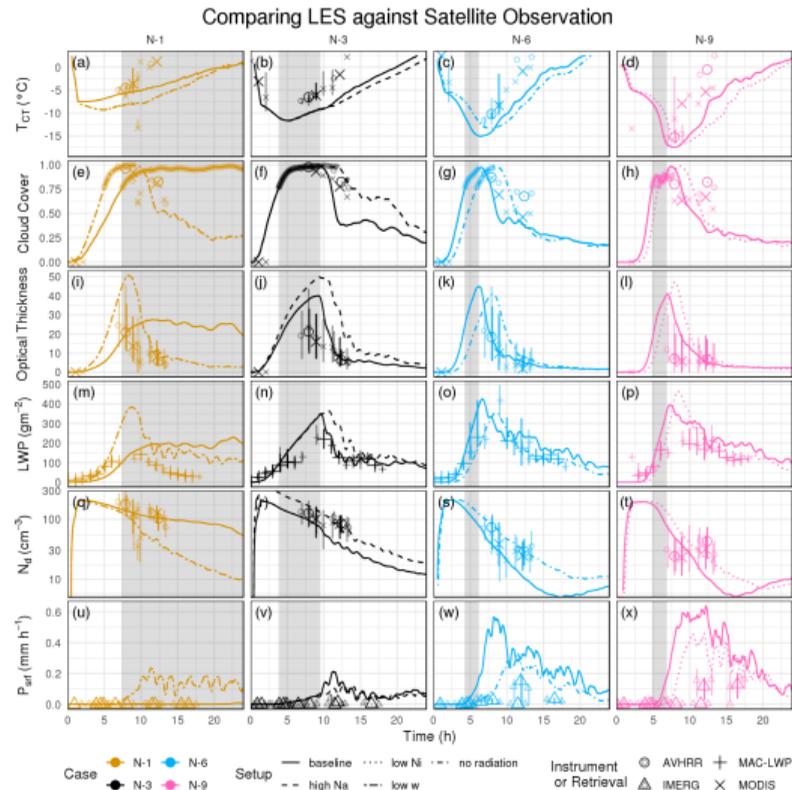
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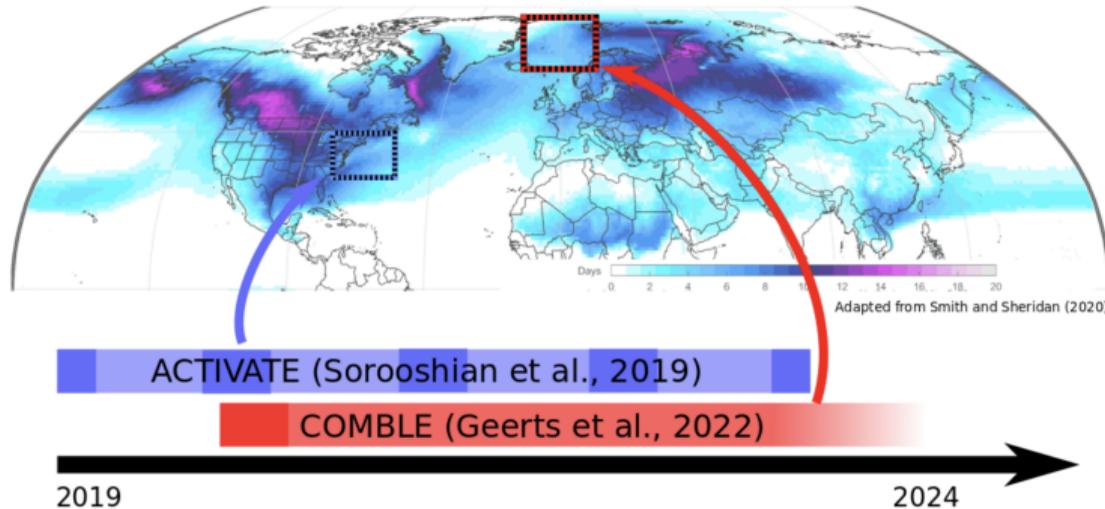
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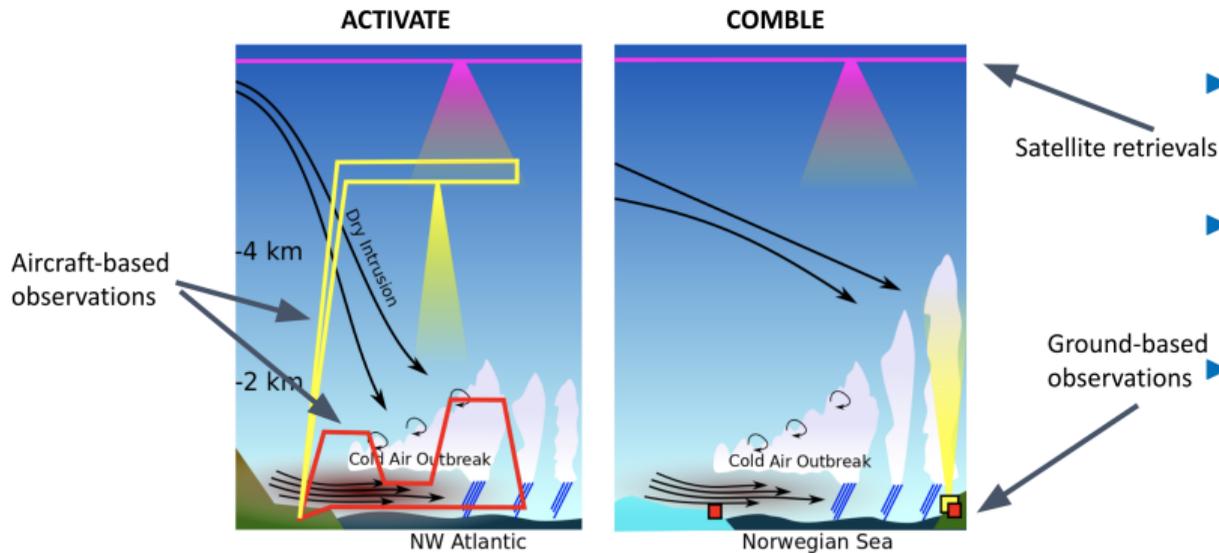


### BREAKOUT GROUP: CAO CLOUD FEEDBACK

- ▶ co-led by Gregory Cesana (Columbia U, NASA GISS)
- ▶ COMBLE as colder past and ACTIVATE as warmer future
- ▶ learn from ongoing model intercomparison efforts conducted for COMBLE
- ▶ breakout participants with split interests:
  - individual CAO cases for Lagrangian LES and SCM
  - earth system model analysis of AMIP(+4K) runs

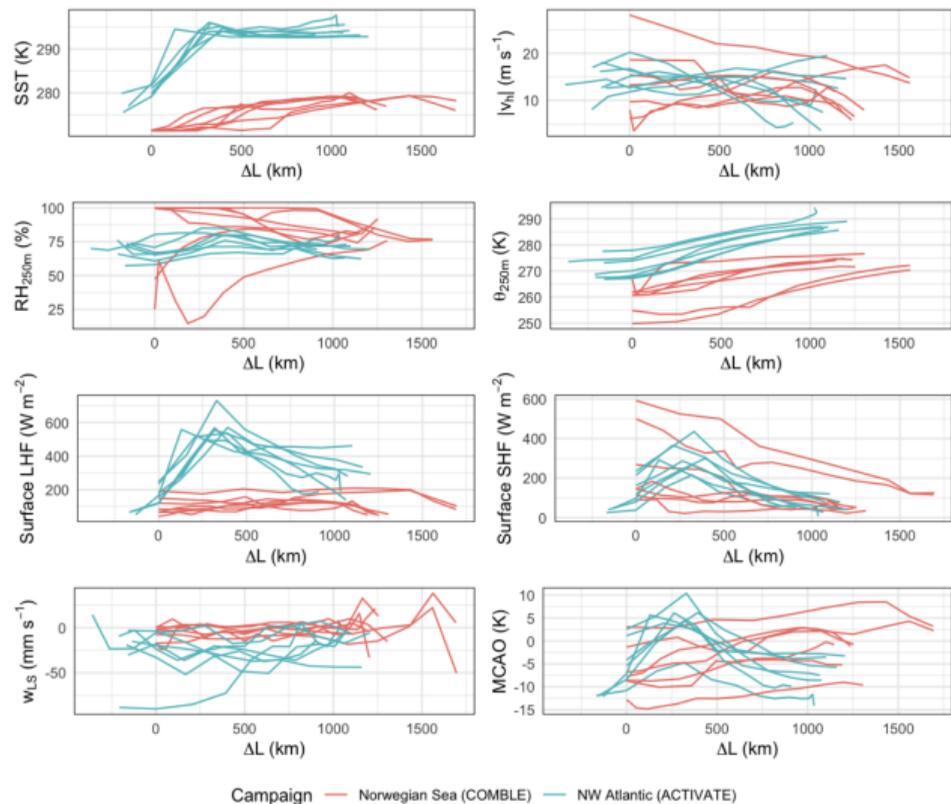
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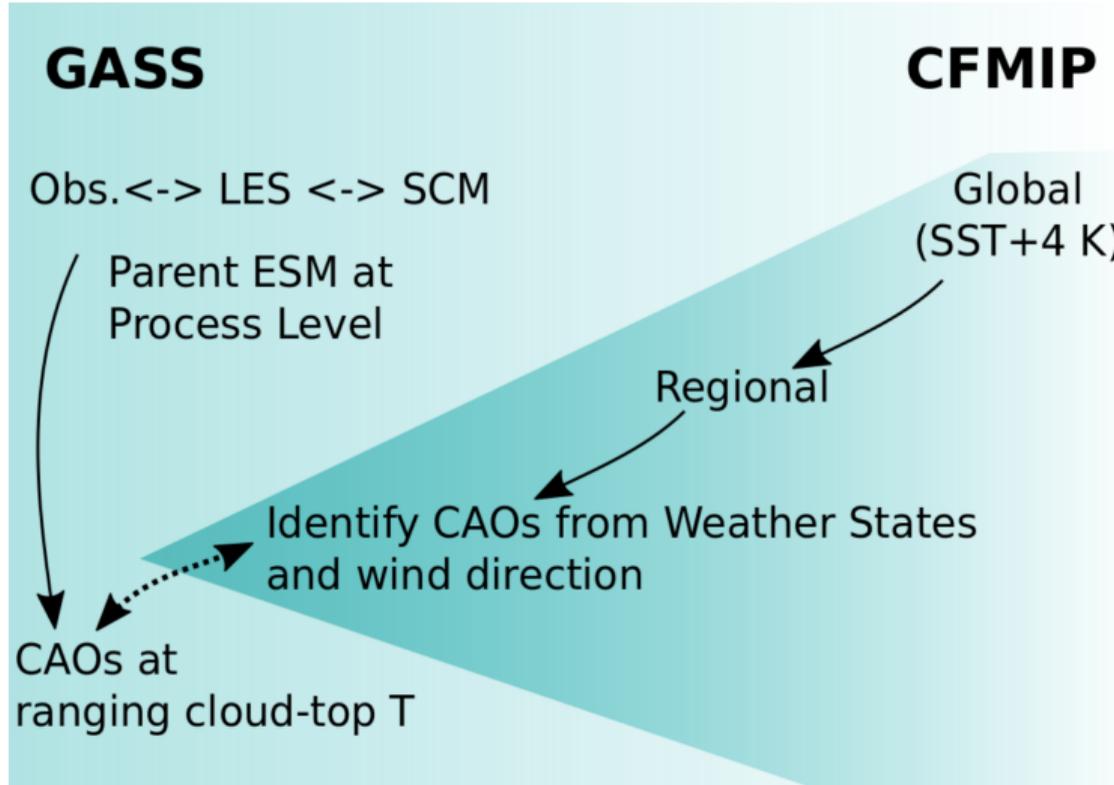
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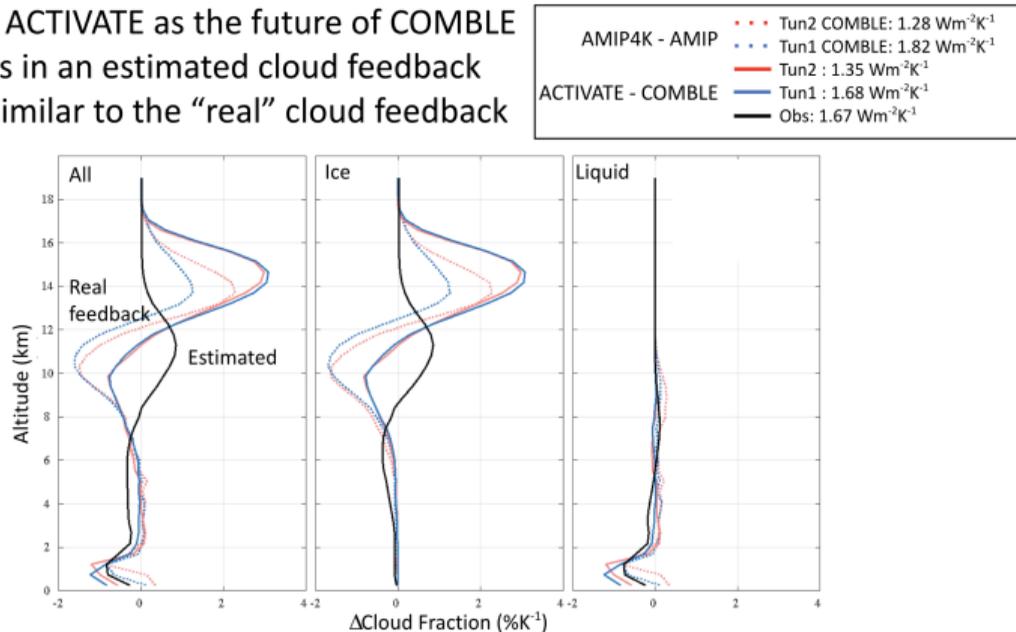


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Using ACTIVATE as the future of COMBLE results in an estimated cloud feedback very similar to the “real” cloud feedback



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